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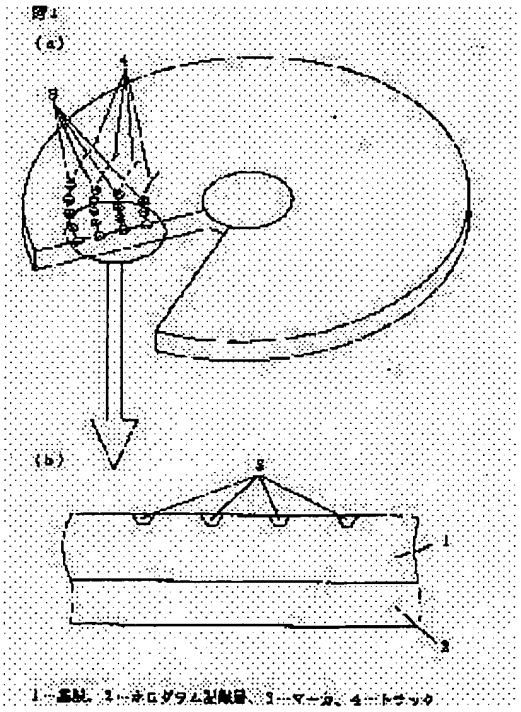
(54) HOLOGRAPHIC OPTICAL RECORDING MEDIUM, AND RECORDING AND REPRODUCING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a holographic optical recording medium which allows the irradiation with high-accuracy reference light and object light and a recording and reproducing device which records and reproduces information by using this holographic optical recording medium.

SOLUTION: The holographic optical recording medium having a substrate transparent to light for hologram recording and light for servo and a hologram recording layer 2 disposed on this substrate 1 as constitution elements is constituted by forming the holographic optical recording medium having markers 3 arrayed on tracks 4 on the substrate 1 and further the recording and reproducing device having a means for recording holograms on the hologram recording layer 2 of the holographic optical recording medium and



a means for reproducing wave fronts from the recorded holograms is constituted to have a servo mechanism of aligning the object light in hologram recording or aligning the reference light in wave front reproducing by means of the markers 3.

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* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to a holographic optical recording medium and a record regenerative apparatus.
[0002]
[Description of the Prior Art] Conventionally, researches and developments of methods, such as include-angle multiplex record, wavelength multiplexing record, and shift multiplex record, are done as a volume holographic recording method. Here, "holographic record" means recording information in the form of a hologram. In every recording method, body light and a reference beam are made to interfere in an optical recording medium at the time of record, and an interference fringe is recorded as a hologram. Restoration playback of the information recorded on the hologram is carried out by irradiating a reference beam on the same conditions as the time of record to an optical recording medium at the time of the wave front reconstruction of light (however, the reference beam of **** power usually being used rather than the time of record at the time of playback).
[0003]
[Problem(s) to be Solved by the Invention] In the conventional holographic record playback (write in information by holographic record and read information by the wave front reconstruction from a hologram), there is no example for which it is commercial level and the commutative optical recording medium (it also sets to a different record regenerative apparatus, and is an usable optical recording medium) was used. As the reason, the precision of wave-front-reconstruction conditions was severe, and the S/N ratio fell only by whenever [incident angle / of the reference beam to an optical recording medium], or a location-error arising, and it had been said that the information on original became is hard to be reproduced.
[0004] Although making the recording layer of an optical recording medium thin, reducing reproductive selectivity, and giving a margin to the optical recording medium itself is also considered in order to conquer the above-mentioned trouble, the problem of stopping being able to fall and carry out high density record of the multiplicity of the multiplex record which is the description of this method conventionally conversely has arisen.
[0005] Thus, in the conventional optical recording medium mentioned above, if it is going to treat as a commutative optical recording medium, problems, such as positioning, will arise and the record playback of the high density data cannot be carried out. In order to take a margin, the small thin film recording layer of volume is needed, and it becomes impossible moreover, to attain sufficient recording density (for example, 200 GB/CD **).
[0006] The technical problem which this invention is made in view of the above-mentioned problem, and this invention tends to solve is to offer the record regenerative apparatus which performs informational record playback using the holographic optical recording medium which enables the exposure of a highly precise reference beam and body light, and its holographic optical recording medium.

[0007]
[Means for Solving the Problem] In order to solve said technical problem, this invention constitutes the holographic optical recording medium which has the marker in whom according to hologram recording layer and light like location detection according to claim 1 is possible.
[0008] Moreover, this invention constitutes the holographic optical recording medium with which said substrate is characterized by having the marker by light in whom location detection is possible in the holographic optical recording medium which has the hologram recording layer according to claim 2 prepared on the substrate and said substrate like.
[0009] Moreover, this invention constitutes the holographic optical recording medium with which said marker is characterized by being prepared in the field of the opposite side with the side according to claim 3 in which said hologram recording layer of said substrate is prepared in a holographic optical recording medium according to claim 2 like.
[0010] Moreover, this invention constitutes the holographic optical recording medium characterized by the thing [that said marker is prepared in the interface of said substrate and said hologram recording layer] according to claim 4 in a holographic optical recording medium according to claim 2 like.
[0011] Moreover, this invention is a holographic optical recording medium which has the hologram recording layer according to claim 5 pinched between two substrates and said two substrates like, and constitutes the holographic optical recording medium with which at least one of said substrates is characterized by having the marker by light in whom location detection is possible.
[0012] Moreover, this invention constitutes the holographic optical recording medium according to claim 1, 2, 3, 4, or 5 characterized by the thing [that they are the crevice where said marker is circular, circular heights, a slot, or linear heights] according to claim 6 like.
[0013] This invention Moreover, a means according to claim 7 to record a hologram on said hologram recording layer of a holographic optical recording medium given in any 1 term of claims 1-6 like, It is the record regenerative apparatus equipped with a means to reproduce a wave front from said recorded hologram. The record regenerative apparatus characterized by having the servo mechanism which performs alignment of the body light at the time of hologram record or alignment of the reference beam at the time of wave front reconstruction by location detection of said marker by light is constituted.
[0014] Moreover, this invention constitutes the record regenerative apparatus characterized by having the configuration in which a body light according to claim 8 at the time of said hologram record and the light used for location detection of said marker pass the same condenser lens in a record regenerative apparatus according to claim 7 like.
[0015] Moreover, this invention constitutes the record regenerative apparatus characterized by having the configuration in which the reference beam according to claim 9 at the time of said wave front reconstruction and the light used for location detection of said marker pass the same condenser lens in a record regenerative apparatus according to claim 7 or 8 like.
[0016] Moreover, this invention constitutes the record regenerative apparatus characterized by having the configuration according to claim 10 which said body light and said reference beam counter on both sides of said hologram recording layer, and carries out incidence to said hologram recording layer like in a record regenerative apparatus according to claim 6, 7, 8, or 9.
[0017]
[Embodiment of the Invention] Although the gestalt of operation of this invention is explained below, record, a call, and the wave front reconstruction from a hologram are only called playback for the hologram record to a hologram recording layer.
[0018] In this invention, the marker for a servo (in this case, positioning of a reference beam or body light) and addressing (in this case, selection of a hologram) is given to a holographic optical recording medium. By this, a proper reference beam and body light are made to interfere in a hologram recording layer with high degree of accuracy by this marker at the time of record, it becomes possible to record the interference fringe to generate on a hologram recording layer, and it becomes possible by tracing this marker at the time of playback to carry out restoration playback of the record data correctly.
[0019] By using the marker for the above-mentioned servo and addressing for a holographic optical

recording medium, a reference beam is irradiated by the hologram, high record playback of compatibility is attained good at the time of playback by precision also in a different record reversion system, and such a holographic optical recording medium can be used as a commutative optical recording medium. Furthermore, since addressing is possible (a desired marker's location can be specified by the number of counts of the marker from for example, a criteria location), before performing hologram playback using a marker, the location of desired data can be searched, without performing hologram playback. Of course, the marker only for addressing different from the above-mentioned marker may be prepared.

[0020]

[Example] The principle [explanatory view / at the time of record / principle / block diagram / of the record regenerative apparatus for using the holographic optical recording medium for drawing 2 for the block diagram of one example of the holographic optical recording medium applied to this invention at [example 1] drawing 1 , and performing informational record playback] explanatory view at the time of playback is shown in drawing 3 at drawing 4 , respectively.

[0021] (a) of drawing 1 is the perspective view showing the whole of one example of the holographic optical recording medium concerning this invention, and (b) of this drawing is the expanded sectional view of the optical recording medium. This holographic optical recording medium is the thing of a disk configuration, as shown in (a) of drawing. However, a holographic card type-like optical recording medium is usable similarly.

[0022] As shown in (b) of drawing 1 , this holographic optical recording medium has the hologram recording layer 2 prepared to the light for hologram record, and the light for servoes on the transparent substrate 1 and the substrate 1 (it sets to drawing 1 and is an inferior surface of tongue). The marker 3 of a circular crevice configuration is formed in the field of the opposite side in the hologram recording layer 2 of a substrate 1. The marker 3 has arranged on the truck 4 (the concentric circle from which a radius differs every only, or spiral of a minute pitch) on a substrate 1, as shown in (a) of drawing 1 . A marker 3 should be just similar to the pit (die length of 0.6-3 micrometers, crevice of 0.4 micrometers of ****) of an optical disk in this case. Furthermore, the circular heights arranged on [other than a circular crevice] the truck 4 as a marker 3, the slot along a truck 4, or (with a slot, it has a complementary relation) linear heights can also be used. "It is circular" in this case shall also contain an ellipse.

[0023] As a hologram recording layer 2, organic film and lithium niobate, such as a resist and a photopolymer, and inorganic material film like SBN (niobic acid strontium barium) can be used. Especially when using the recording layer which is easy to deteriorate, the protective coat for passivation is prepared.

[0024] Drawing 2 shows an example of the configuration of the record regenerative apparatus (transparency mold) concerning this invention. It is the holographic optical recording medium which 201 requires for this invention in drawing. 202 is laser for servoes which is the light source for servoes, and 203 is a half mirror which turns the return beam for servoes to a position transducer 206, and is reflected. 204 is a half mirror for carrying out incidence of the laser beam for servoes to a condenser lens 205 together with the body light 209. 205 is a condenser lens on which the laser beam and the body light 209 for servoes are doubled, and the marker of the holographic optical recording medium 201 is converged. 206 is a position transducer which asks for the relative-position relation between the incidence location of the laser beam for the servoes from the optical intensity distribution to the holographic optical recording medium 201, and the above-mentioned marker, and feeds back the positional information to servo mechanism in response to the return beam for servoes. 207 is the laser for record playback (532nm, 100mW), and 208 is a beam splitter which divides the light from the laser 207 for record playback into the body light 209 and a reference beam 210. 211 is a shutter which intercepts the optical path of the body light 209 at the time of playback, and 212 is a beam expander which extends a beam so that the body light 209 may carry out incidence to the space optical modulator 213 whole. 213 is a space optical modulator which operates according to input, and 214 is an objective lens (condenser lens for reference beams) which converges a reference beam 210 on the marker of the holographic optical recording medium 201. 215 is a lens for playback required in order that a playback

wave front may reconfigurate the image pattern on the space optical modulator 213 on the image pick-up side of CCD216, 216 is CCD which picturizes the above-mentioned image pattern, and 217 is a mirror for changing the direction of a reference beam 210.

[0025] The beam light by which outgoing radiation was carried out from the laser 207 for record playback at the time of record is divided into the body light 209 and a reference beam 210 by the beam splitter 208. It can extend with the beam expander 212, passes along the space optical modulator 213, and is condensed with a condenser lens 205, and the body light 209 is irradiated by the holographic optical recording medium 201. On the other hand, after a reference beam 210 is divided by the beam splitter 208, it is reflected by the mirror 217 and incidence of it is carried out to the holographic optical recording medium 201. At this time, the data (it is an image pattern) in which the condensed body light 209 was formed with the lifting and the space optical modulator 213 in an optical interference in the hologram recording layer of a reference beam 210 and the holographic optical recording medium 201 are recorded as an interference fringe. the optical path as the body light 209 with the laser beam same by the half mirror 204 by which the Z-axis servo (focal location regulating automatically and the Z-axis are parallel to an optical axis) has started the condenser lens 205, and outgoing radiation was carried out from the laser 202 for servoes at this time -- a passage -- the holographic optical recording medium 201 -- incidence is carried out so that a focus may suit by the marker. Moreover, the tracking sampling servo (radial automatic justification of the disk configuration holographic optical recording medium 201) has also always started, and even if the holographic optical recording medium 201 is carrying out eccentricity, record is performed with sufficient reappearance to a position. In addition, if a marker 3 is a circular crevice as shown in drawing 1 , the servo of the hoop direction of the holographic optical recording medium 201 of him will become possible, and location precision of record playback will improve further. What is necessary is to record instead of the servo of a hoop direction by controlling the angle of rotation of the holographic optical recording medium 201 to a precision, or to rotate the holographic optical recording medium 201 with constant speed, and just to perform hologram record by the light pulse with a fixed time interval, when a marker 3 is the groove thing which met the truck 4 unlike what was shown in drawing 1 .

[0026] In addition, although the high laser of a coherency is used for the laser 207 for record playback, as laser 202 for servoes, the laser (coherence length is short) of a low coherency is used. Moreover, both the reference beams 210 that were reflected by the body light 209 and the mirror 217 which passed along the condenser lens 205 in the case of drawing 2 , and passed along the objective lens 214 are focusing spherical waves.

[0027] In the record regenerative apparatus shown in drawing 2 , the light for performing the body light 209 and a servo has passed the same condenser lens 205. the number of a lens is reduced by using such a configuration -- relative-position relation between a hologram and a marker can both be made more exact. The number of a lens can be further reduced by similarly letting the light for [as / in the below-mentioned example 3 (drawing 9)] performing a reference beam 904 and a servo pass to the same condenser lens 906.

[0028] At the time of playback, the body light 209 is interrupted by the shutter 211 and only a reference beam 210 carries out incidence to the holographic optical recording medium 201. If a reference beam 210 carries out incidence to the hologram recorded on the hologram recording layer of the holographic optical recording medium 201, the focusing spherical wave of the body light 209 at the time of record will be reproduced as an emission spherical wave (turning in the direction opposite to the time of record). The playback wave front passes along the lens 215 for playback, and carries out image formation of the data (it is an image pattern) formed with the space optical modulator 213 at the time of record as real-image drawing on the image pick-up side of CCD216. Record data are reproduced by changing into an electrical signal this real-image drawing by which image formation was carried out by CCD216, and performing digital processing to that signal.

[0029] Drawing 3 shows the principle explanatory view at the time of the hologram record in this invention. In drawing 301, 302, and 303, respectively The substrate of a holographic optical recording medium, It is a hologram recording layer and a marker, 304 is a reference beam, and 305 is the body

light which passed along the space optical modulator 306. 306 is a space optical modulator which generates the image pattern which bore input. 307 is an objective lens which turns a reference beam 304 to the hologram recording layer 302, and condenses, 308 is a condenser lens which turns the body light 305 to the hologram recording layer 302, and condenses, and 309 is a record section in which the hologram in the hologram recording layer 302 is formed.

[0030] It is condensed with a condenser lens 308 and the focus of the body light 305 which bore information through the space optical modulator 306 is carried out to the location of the marker 303 of substrate 301 rear face. At this time, as drawing 2 explained, even if the Z-axis servo has started the condenser lens 308, the focus of the body light 305 is always carried out to a marker's 303 location at the time of record and curvature and a wave are in a holographic optical recording medium, it is recordable with sufficient repeatability.

[0031] Drawing 4 shows the principle explanatory view at the time of the holography playback by this invention. In drawing 401, 402, and 403, respectively The substrate of a holographic optical recording medium, It is a hologram recording layer and a marker, and 404 is laser for servoes which is the light source for servoes. 405 is a half mirror which turns the return beam for servoes to a position transducer 408, and is reflected. 406 is the body light at the time of record (a display with the inside of drawing, and a broken line) about the laser beam for servoes. It is a half mirror for doubling being intercepted at the time of playback and carrying out incidence to a condenser lens 407. 407 is a condenser lens which converges the laser beam for servoes on the marker 403 of a holographic optical recording medium. 408 is a position transducer which asks for the incidence location of the laser beam for the servoes from the optical intensity distribution to a holographic optical recording medium, and feeds back the positional information to servo mechanism in response to the return beam for servoes. 409 is a record section in which the hologram is formed in the hologram recording layer 402, 410 is a reference beam for playback, 411 is a condenser lens which turns a reference beam 410 to the hologram recording layer 402, and condenses, and 412 is a playback lens for carrying out image formation of the playback wave front as a reconstruction image 413 (real image) on a CCD image pick-up side.

[0032] Carrying out focusing for the light of the laser 404 for servoes on a marker with a condenser lens 407 through half mirrors 405 and 406, a position transducer 408 receives a return beam, according to the servo mechanism which makes the output of a position transducer 408 a feedback signal, the hologram recorded on the record section 409 of the hologram recording layer 402 is put on the same location as the time of record, and a reference beam 410 is irradiated in a record section 409. This reference beam 410 is diffracted in a record section 409, and generates a playback wave front. Image formation of this playback wave front is carried out as a reconstruction image 413 (real image) on a CCD image pick-up side through the lens 412 for playback installed on the substrate 401 rear face. Restoration playback of the data currently recorded by carrying out digital conversion of this reconstruction image 413 is carried out.

[0033] The flow of the above data-logging process is shown in drawing 5 , and the flow of a data renewal process is shown in drawing 6 .

[0034] In a data-logging process, as shown in drawing 5 , coding processing of the digital data treated by computer is first carried out as a digital image pattern. Carry out light modulation of this digital pattern as an image image with a space optical modulator, it is made to interfere in a reference beam and a holographic optical recording medium, and information is made to record as an interference fringe. In addition, the servo is applied to the position coordinate of body light at this time.

[0035] In a data renewal process, as shown in drawing 6 , the marker position where hologram record was performed to the optical recording medium is detected, and a reference beam is irradiated at the logged point. The inverse Fourier transform of the playback light diffracted from a holographic optical recording medium is carried out through a lens by it, image formation of the image pattern is carried out on a CCD image pick-up side, and it reproduces as image information. Decryption processing of this image is carried out, and the digital data currently recorded on the holographic optical recording medium is reproduced. In addition, the servo is applied to the exposure location of a reference beam.

[0036] As explained above, by operation of this invention, by forming the marker for servoes in a

substrate rear face, repeatability is good and holographic record playback was attained.
The block diagram of another example of the holographic optical recording medium applied to this invention at [example 2] drawing 7 is shown. In this example, if the marker 703 for servoes sees from a substrate 701 side to the interface of the transparent substrate 701 and the hologram recording layer 702 to the light for hologram record, and the light for servoes and it will see from the hologram recording layer 702 side as a local crevice as shown in drawing 7 , it is prepared as heights.
[0037] Holographic record playback was possible with sufficient repeatability by doubling the marker 703 for servoes with an optical exposure location correctly using the holographic optical recording medium shown in drawing 7 , and the record regenerative apparatus in an example 1 at the time of record playback. Moreover, even if it carried out incidence from the hologram recording layer 702 side as well as the example 1 even if it carried out incidence of the light for record playback from the substrate 701 side on the contrary [an example 1] and carried out record playback, and it carried out record playback, comparable record playback was possible.
The block diagram of still more nearly another example of the holographic optical recording medium applied to this invention at [example 3] drawing 8 is shown. in this example, as shown in drawing 8 , the hologram recording layer 802 inserts between two transparent substrates 801 to the light for hologram record, and the light for servoes -- having -- **** -- two substrates 801 -- the marker 803 for servoes is formed in the field of the opposite side in each hologram recording layer 802.
[0038] The principle [explanatory view / at the time of using the holographic optical recording medium shown in drawing 8 / at the time of record / principle] explanatory view at the time of playback is shown in drawing 9 at drawing 10 , respectively.
[0039] In drawing 9 , 901, 902, and 903 are the same as the substrate 801 in drawing 8 , the hologram recording layer 802, and a marker 803 respectively. 904 is a reference beam, 905 is body light, 906 and 907 are condenser lenses, and 908 is a record section in which the hologram in the hologram recording layer 902 is formed.
[0040] The servo is applied so that a focus may be connected to the marker 903 whom a reference beam 904 and the body light 905 have in each rear face (namely, plane of incidence front face of the substrate 901 of the opposite side) with each condenser lens 906 and 907. The optical path of a reference beam 904 and the body light 905 is overlapped on the laser beam for servoes, when the focus of two condenser lenses 906 and 907 suits coincidence, a reference beam 904 and the body light 905 are irradiated by the hologram recording layer 902, and the interference fringe formed of it is recorded on the record section 908 of the hologram recording layer 902.
[0041] In drawing 10 , 1001, 1002, and 1003 are the same as the substrate 801 in drawing 8 , the hologram recording layer 802, and a marker 803 respectively. 1004 is laser for servoes which is the light source for servoes, and 1005 is a half mirror which turns the return beam for servoes to a position transducer 1009, and is reflected. 1006 is a half mirror for carrying out incidence of the laser beam for servoes to a condenser lens 1008 together with the body light at the time of record (intercepted at the time of playback). 1007 and 1008 are condenser lenses and 1009 is a position transducer which asks for the incidence location of the laser beam for the servoes from the optical intensity distribution to a holographic optical recording medium, and feeds back the positional information to servo mechanism in response to the return beam for servoes. 1010 is a record section in which the hologram is formed in the hologram recording layer 1002, 1011 is a reference beam for playback, 1012 is a playback light generated when a reference beam 1011 carries out incidence to a record section 1010, and 1013 is a reconstruction image which carries out image formation on a CCD image pick-up side.
[0042] the marker 1003 who boils two condenser lenses 1007 and 1008 which countered by the laser beam for servoes, respectively, and corresponds although body light is not irradiated at the time of playback -- a focus -- **** -- the servo is carried out like. When the focus of two condenser lenses 1007 and 1008 suits coincidence, a reference beam 1011 is diffracted in the record section 1010 of the hologram recording layer 1002, turns into the playback light 1012, and carries out image formation as a reconstruction image 1013 (real image) on a CCD image pick-up side through a condenser lens 1008. A reconstruction image 1013 is an image pattern, is changed into an electrical signal by CCD and

outputted as playback digital data through decryption processing.
[0043] It considers as the configuration [as / in this example] is countered on both sides of the hologram recording layer 902, and incidence of a reference beam 904 and the body light 905 is carried out [configuration] to the hologram recording layer 902. Furthermore, if the symmetrical optical system 906 and 907, i.e., the two same lenses of spec. (specification), uses optical system which is in the location of the symmetry considering the hologram recording layer 902 as plane of symmetry Although the lens design needed to use conventionally the expensive lens which does not have a strain severely since the effectiveness of the lens strain at the time of record was canceled at the time of playback, a general-purpose optical lens with the conventional strain becomes usable in this invention.
Three examples from which the relative relation of the thickness of two substrates differs in the same holographic optical recording medium as an example 3 in [example 4] drawing 11 are shown. In drawing, 1101 is a reference beam side substrate, 1102 is a body light side substrate, 1103 is a hologram recording layer, 1104 is a marker, and 1105 is a record section in which the hologram in the hologram recording layer 1103 is formed.
[0044] In drawing 11 , (a) shows the case where the reference beam side substrate 1101 is thinner than the body light side substrate 1102, (b) shows the case where the reference beam side substrate 1101 is thicker than the body light side substrate 1102, and (c) shows the case where the reference beam side substrate 1101 and the body light side substrate 1102 have the same thickness.
[0045] The account rec/play student of HOROGURABBUIKU was possible for any above-mentioned case with sufficient repeatability.
The example from which a marker's location differs variously in the same holographic optical recording medium as an example 3 in [example 5] drawing 12 is shown. In drawing, 1201 is the 1st substrate, 1202 is the 2nd substrate, 1203 is a hologram recording layer, 1204 is a marker, and 1205 is a record section in which the hologram in the hologram recording layer 1203 is formed.
[0046] In drawing 12 , (a) shows the case where the marker 1204 of the 1st substrate 1201 and the marker 1204 of the 2nd substrate 1202 counter on both sides of the hologram recording layer 1203. (b) The case where it has shifted in the direction in which the marker 1204 of the 1st substrate 1201 and the marker 1204 of the 2nd substrate 1202 meet at the hologram recording layer 1203 in (a) (in location) is shown. (c) has the marker 1204 of the 1st substrate 1201 in the interface of the 1st substrate 1201 and the hologram recording layer 1203. The marker 1204 of the 2nd substrate 1202 shows the case where it is in the field of the opposite side, in the hologram recording layer 1203. The case where (d) has a marker 1204 in both sides of the 2nd substrate 1202 is shown. The case where (e) has a marker 1204 in both sides of the 1st substrate 1201 is shown. (f) has the marker 1204 of the 1st substrate 1201 in the field of the opposite side in the hologram recording layer 1203, and shows the case where the marker 1204 of the 2nd substrate 1202 is in the interface of a substrate 1202 and the hologram recording layer 1203. In addition, in (d) and (e), the 1st substrate 1201 and the 2nd substrate 1202 (neither is equipped with the marker) may not be, respectively.
[0047] When were shown in drawing 12 , and a marker's 1204 gap width of face (it illustrates to (b) of drawing 12) was smallness from a marker's 1204 pitch (distance between contiguity markers) and it was [all] smallness from the thickness of the whole holographic optical recording medium, HOROGURAFFIKKU record playback was possible with sufficient repeatability.
[0048] The record playback with good reappearance was attained by performing holographic record playback, operating servo mechanism using the holographic optical recording medium which has a hologram recording layer and a marker for the servo at the time of hologram record and wave front reconstruction, and addressing, as explained above. Therefore, even if it used the holographic optical recording medium concerning this invention as a commutative holographic optical recording medium, it became possible to fully cancel the position error accompanying the individual difference of a record reversion system, and it became possible to offer a commutative holographic optical recording medium by operation of this invention.
[0049] The thing same as servo mechanism in this invention as the servo mechanism in the optical disk unit put in practical use widely can be used. Moreover, as a marker by the light in this invention in

whom location detection is possible, the minute field where the refractive index other than the above-mentioned minute irregularity differs from a perimeter, the minute field where a reflection factor differs from a perimeter can be used.

[0050] In the record regenerative apparatus concerning this invention, the wavelength of the light used for hologram record may differ from the wavelength of the light used for a servo. If the light especially used for a servo does not expose the sensitive material used for hologram record, it becomes unnecessary for the light used for a servo at the time of record to consider the effect which it has on sensitive material, and it is convenient. Trouble is not produced unless the holograms which the interrelation of the location where the light used for hologram record converges according to the chromatic aberration of a lens, and the location where the light used for a servo converges adjoins although only the part of a wavelength difference changes from an interrelation when wavelength is equal slightly overlap.

[0051]

[Effect of the Invention] The record regenerative apparatus which performs informational record playback by operation of this invention using the holographic optical recording medium which enables the exposure of a highly precise reference beam and body light, and its holographic optical recording medium can be offered.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram of the holographic optical recording medium in the example 1 of this invention.
[Drawing 2] It is the block diagram of the record regenerative apparatus in the example 1 of this invention.
[Drawing 3] It is the principle explanatory view of the hologram record in the example 1 of this invention.
[Drawing 4] It is the principle explanatory view of the hologram playback in the example 1 of this invention.
[Drawing 5] It is drawing showing the flow of the data-logging process in the example 1 of this invention.
[Drawing 6] It is drawing showing the flow of data ********** in the example 1 of this invention.
[Drawing 7] It is the block diagram of the holographic optical recording medium in the example 2 of this invention.
[Drawing 8] It is the block diagram of the holographic optical recording medium in the example 3 of this invention.
[Drawing 9] It is the principle explanatory view of the hologram record in the example 3 of this invention.
[Drawing 10] It is the principle explanatory view of the hologram playback in the example 3 of this invention.
[Drawing 11] It is the principle explanatory view of the hologram record playback in the example 4 of this invention.
[Drawing 12] It is the principle explanatory view of the hologram record playback in the example 5 of this invention.
[Description of Notations]
1 [-- A truck, 201 / -- Holographic optical recording medium,] -- A substrate, 2 -- A hologram recording layer, 3 -- A marker, 4 202 -- The laser for servoes, 203 -- A half mirror, 204 -- Half mirror, 205 -- A condenser lens, 206 -- A position transducer, 207 -- Laser for record playback, 208 [-- Shutter,] -- A beam splitter, 209 -- Body light, 210 -- A reference beam, 211 212 -- A beam expander, 213 -- A space optical modulator, 214 -- Objective lens, 215 [-- Substrate,] -- The lens for playback, 216 -- CCD, 217 -- A mirror, 301 302 [-- Body light,] -- A hologram recording layer, 303 -- A marker, 304 -- A reference beam, 305 306 -- A space optical modulator, 307 -- An objective lens, 308 -- Condenser lens, 309 [-- Marker,] -- A record section, 401 -- A substrate, 402 -- A hologram recording layer, 403 404 -- The laser for servoes, 405 -- A half mirror, 406 -- Half mirror, 407 [-- Reference beam,] -- A condenser lens, 408 -- A position transducer, 409 -- A record section, 410 411 [-- Substrate,] -- An objective lens, 412 -- The lens for playback, 413 -- A reconstruction image, 701 702 [-- Hologram recording layer,] -- A hologram recording layer, 703 -- A marker, 801 -- A substrate, 802 803 [-- Marker,] -- A marker, 901 -- A substrate, 902 -- A hologram recording layer, 903 904 [--

Condenser lens,] -- A reference beam, 905 -- Body light, 906 -- A condenser lens, 907 908 -- A record section, 1001 -- A substrate, 1002 -- Hologram recording layer, 1003 -- A marker, 1004 -- The laser for servoes, 1005 -- Half mirror, 1006 -- A half mirror, 1007 -- A condenser lens, 1008 -- Condenser lens, 1009 [-- Playback light,] -- A position transducer, 1010 -- A record section, 1011 -- A reference beam, 1012 1013 -- A reconstruction image, 1101 -- A reference beam side substrate, 1102 -- Body light side substrate, 1103 [-- The 1st substrate, 1202 / -- The 2nd substrate, 1203 / -- A hologram recording layer, 1204 / -- A marker, 1205 / -- Record section.] -- A hologram recording layer, 1104 -- A marker, 1105 -- A record section, 1201

[Translation done.]

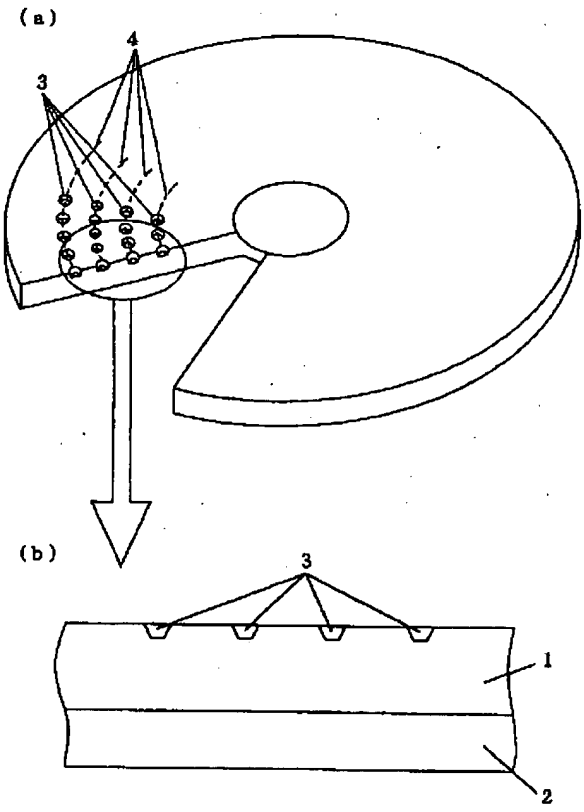
* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]

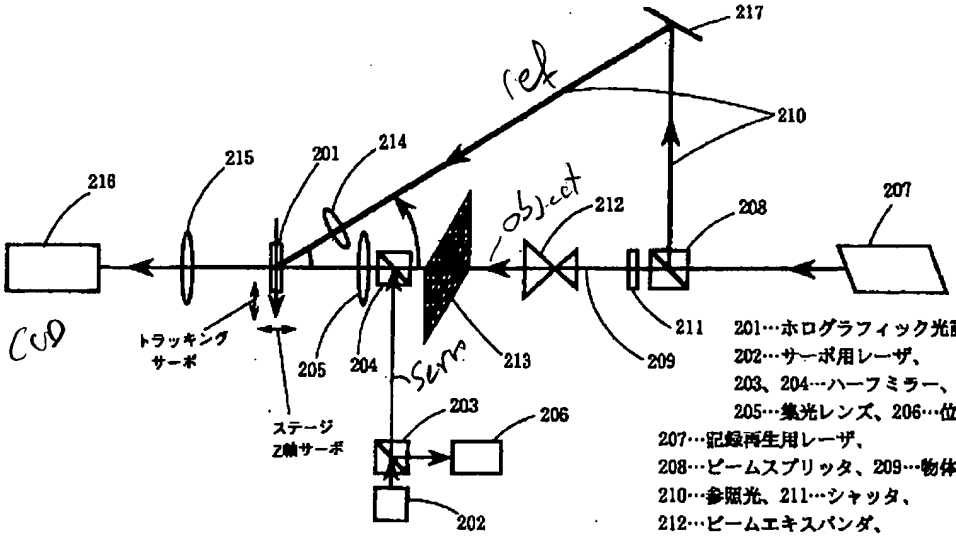
図1



1…基板、2…ホログラム記録層、3…マーカ、4…トラック

[Drawing 2]

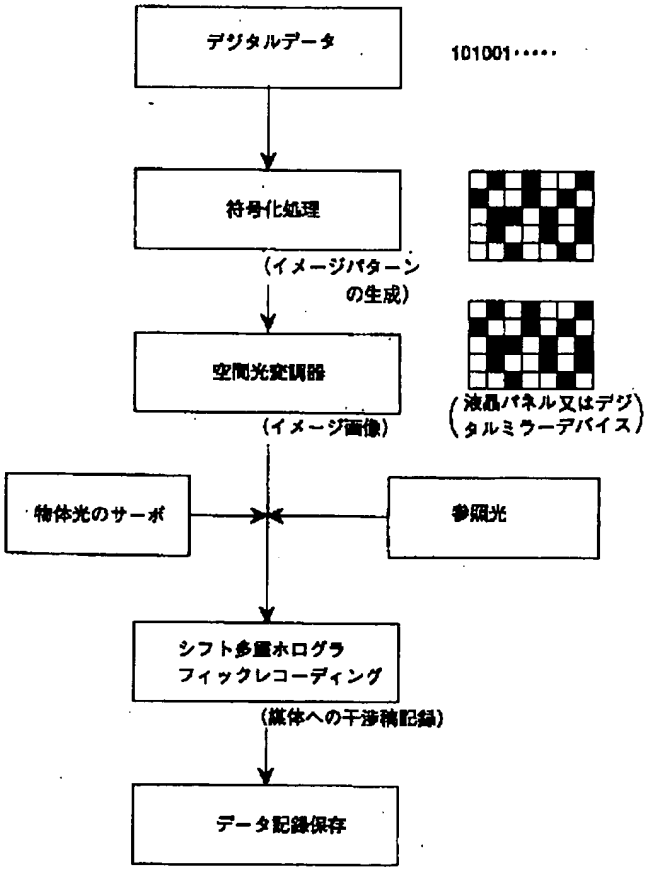
図2



201…ホログラフィック光記録媒体、
202…サーボ用レーザ、
203、204…ハーフミラー、
205…集光レンズ、206…位置検出器、
207…記録再生用レーザ、
208…ビームスプリッタ、209…物体光、
210…参照光、211…シャッタ、
212…ビームエキスパンダ、
213…空間光変調器、214…対物レンズ、
215…再生用レンズ、216…ＣＣＤ、217…ミラー

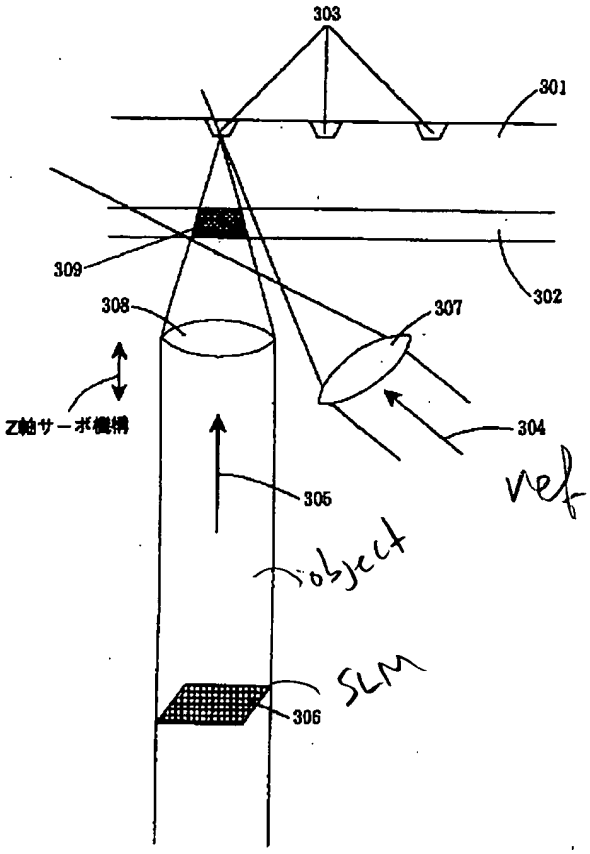
[Drawing 5]

図5



[Drawing 3]

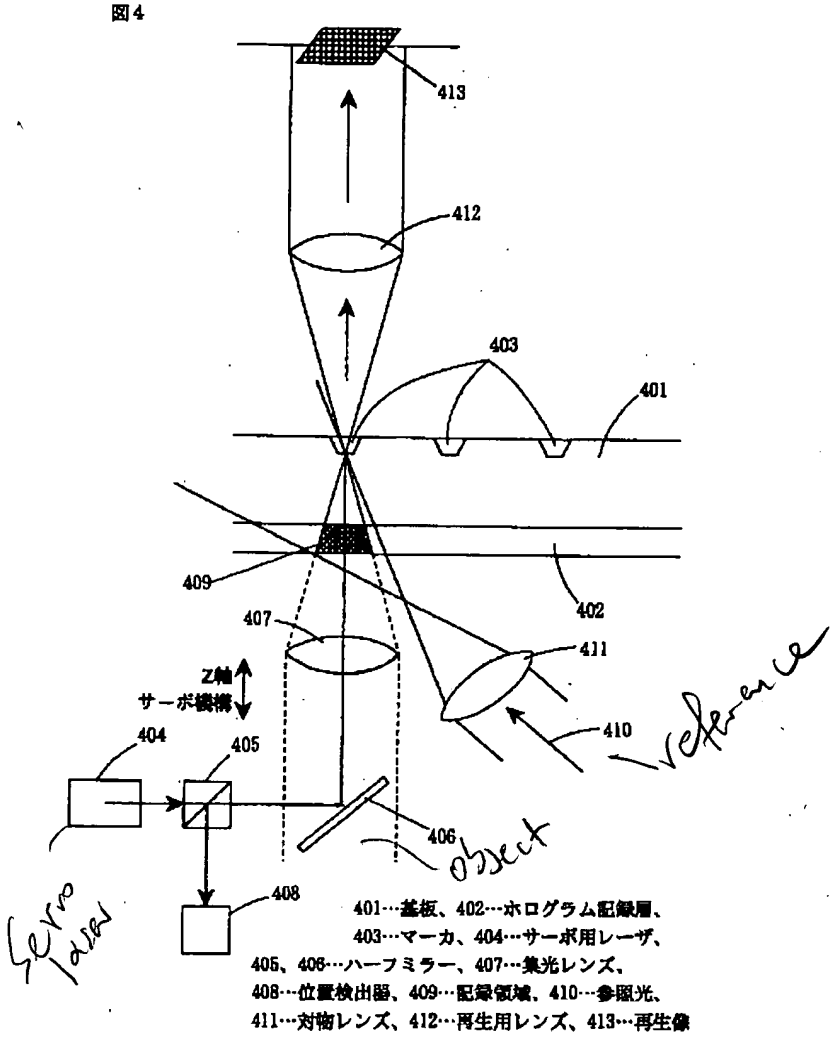
図3



301…基板、302…ホログラム記録層、303…マーカ、304…参照光、
305…物体光、306…空間光変調器、307…対物レンズ、
308…集光レンズ、309…記録領域

[Drawing 4]

図4


413
412
403
401
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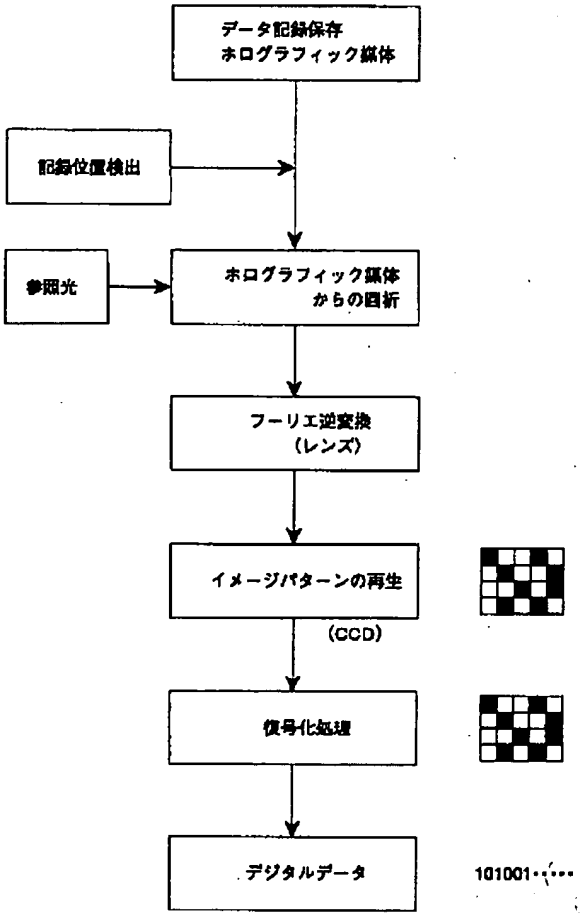
402
407
411
Z軸
サーボ機構
404
405
410
406
408
401…基板、402…ホログラム記録層、
403…マーカ、404…サーボ用レーザ、
405、406…ハーフミラー、407…集光レンズ、
408…位置検出器、409…記録領域、410…参照光、
411…対物レンズ、412…再生用レンズ、413…再生像

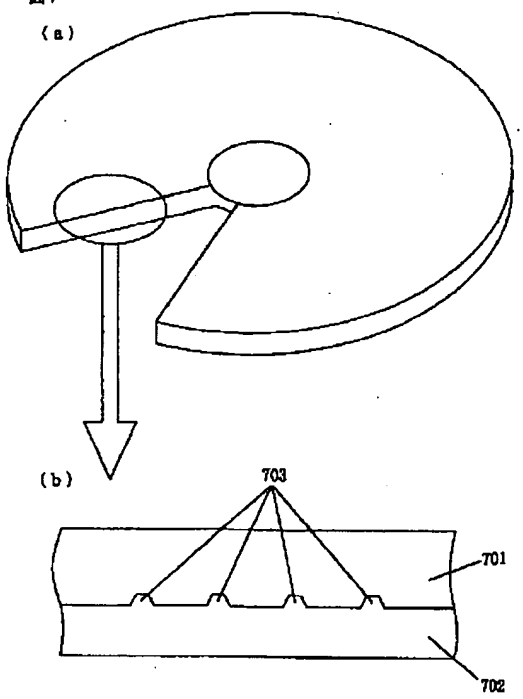
[Drawing 6]

図6



[Drawing 7]

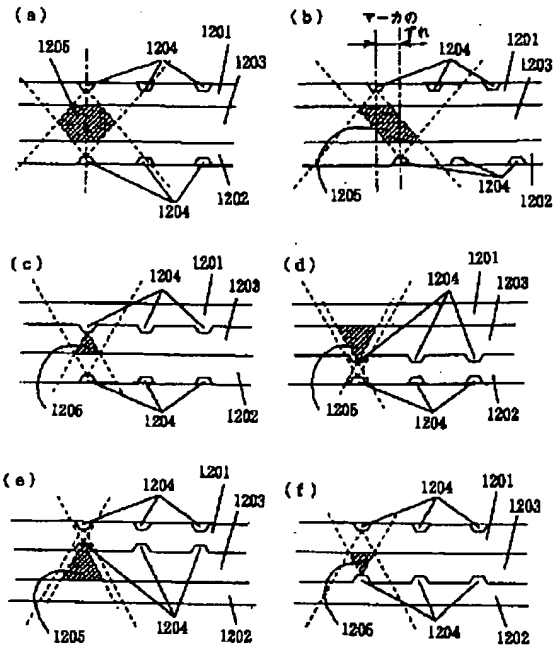
図7



701…基板、702…ホログラム記録層、703…マーカ

[Drawing 12]

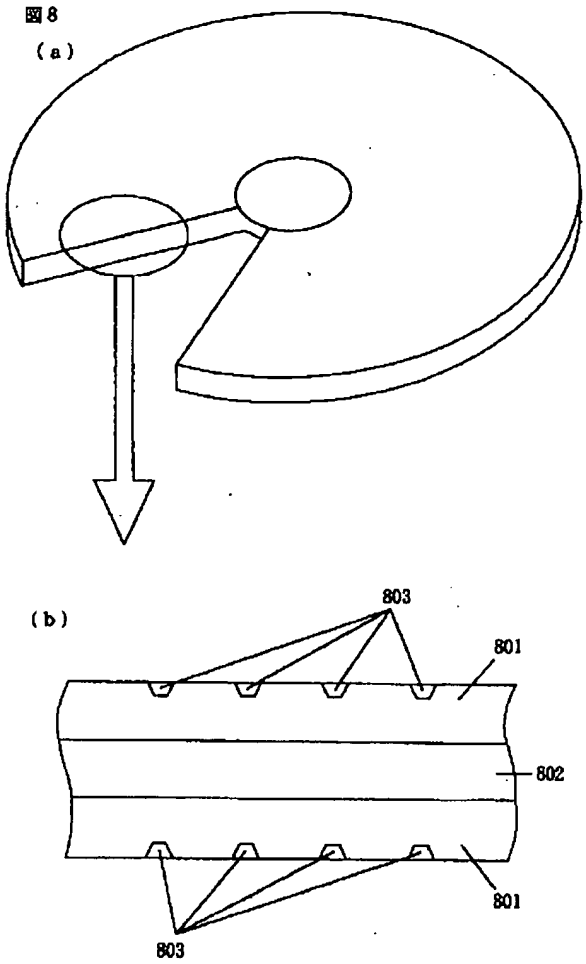
図１２



1201…第１の基板、1202…第２の基板、1203…ホログラム記録層、
1204…マーカ、1205…記録領域

[Drawing 8]

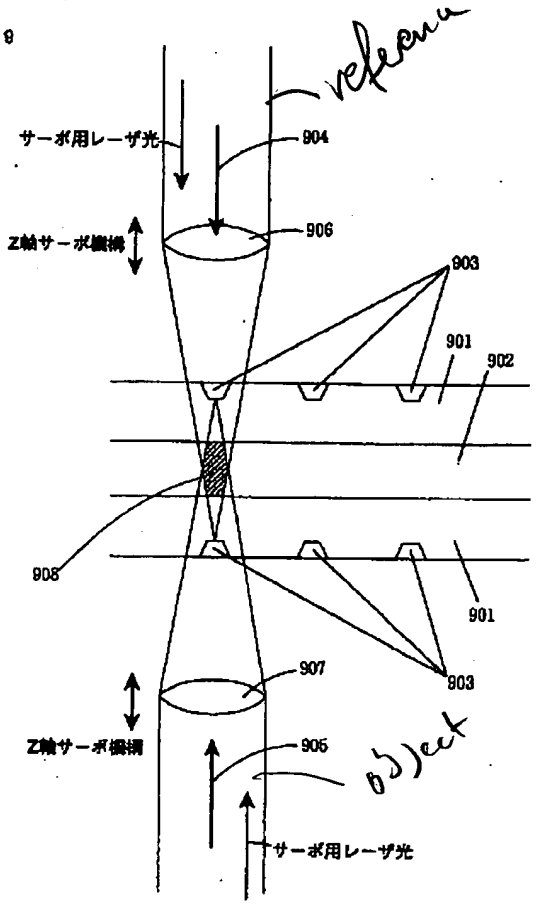
図8



801…基板、802…ホログラム記録層、803…マーカ

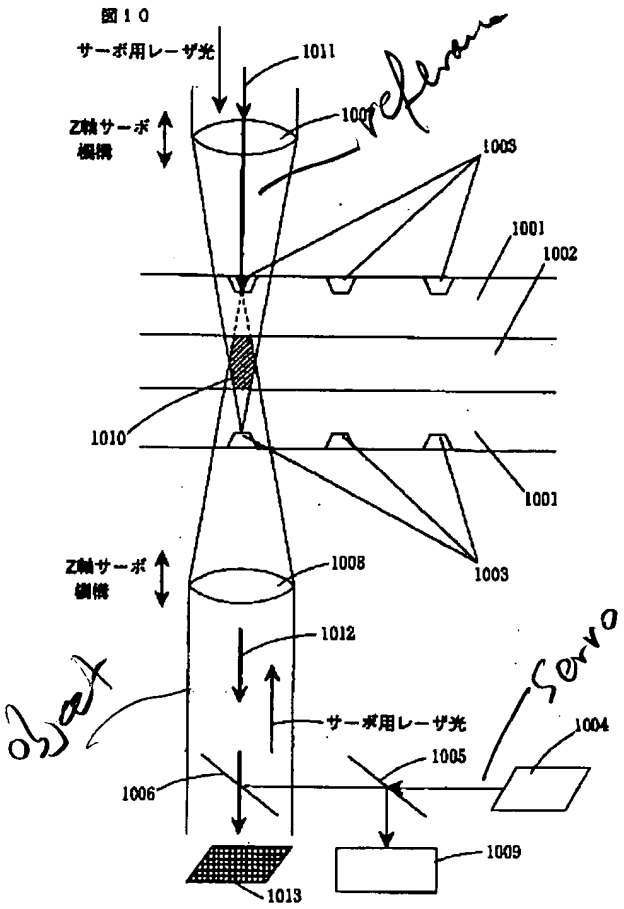
[Drawing 9]

図9



901…基板、902…ホログラム記録層、903…マーカ、904…参照光、
905…物体光、906…集光レンズ、907…集光レンズ、908…記録領域

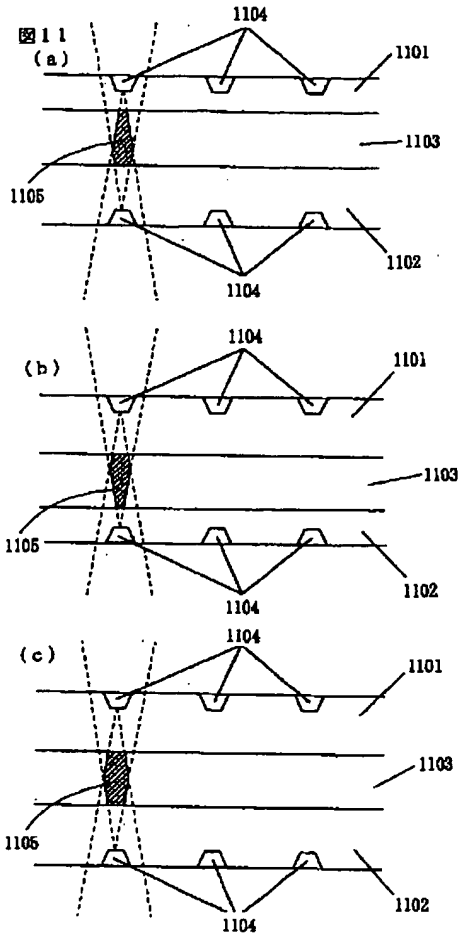
[Drawing 10]



1001…基板、1002…ホログラム記録層、1003…マーカ、
1004…サーボ用レーザ、1005…ハーフミラー、1006…ハーフミラー、
1007…集光レンズ、1008…集光レンズ、1009…位置検出器、
1010…記録領域、1011…参照光、1012…再生光、1013…再生像

[Drawing 11]

図１１



1101…参照光側基板、1102…物体光側基板、1103…ホログラム記録層、
1104…マーカ、1105…記録領域

[Translation done.]